

Missouri Department of Natural Resources

Total Maximum Daily Load Information Sheet

Middle, Tributary to Middle and West Fork of Tebo Creeks

Waterbody Segment at a Glance:

County: Henry
Nearby Cities: Windsor, Calhoun
Length of impairment: 18 miles
Pollutants: Sulfate and pH
Source: Abandoned mine lands



State map showing location of watershed

TMDL Priority Ranking:

Middle, Tributary to Middle and West Fork Tebo Creeks--Medium

Description of the Problem

Beneficial uses of the Tebo Creeks

- Livestock and Wildlife Watering
- Protection of Warm Water Aquatic Life and Human Health [associated with] Fish Consumption

Use that is impaired

- Protection of Warm Water Aquatic Life

Standards that apply

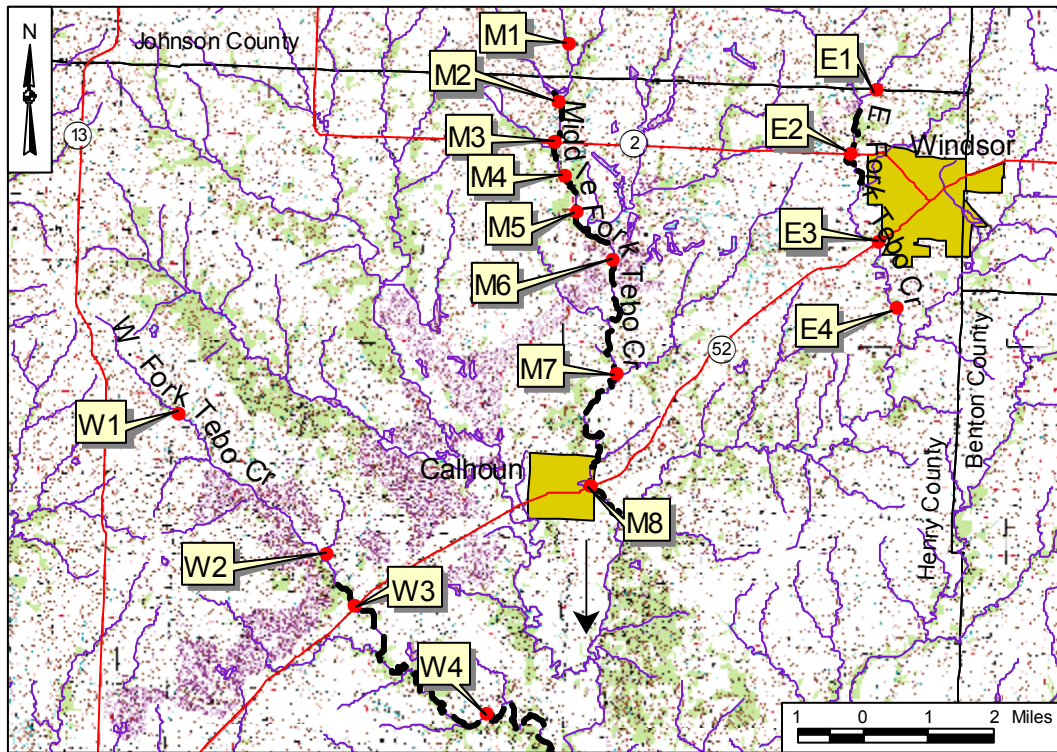
- The impairment of this waterbody is based on exceedence of the specific criteria contained in Missouri's Water Quality Standards, 10 CSR 20-7.031. The specific criteria state:
 - pH. Water contaminants shall not cause pH to be outside of the range of 6.5-9.0. 10 CSR 20-7(4)(E).
 - Sulfate and Chloride Limit for Protection of Aquatic Life. The concentration of chloride plus sulfate shall not exceed one thousand milligrams per liter (1000 mg/L). Table A includes additional chloride criteria. 10 CSR 20-7(4)(L)2.

The Tebo Creek area has been an important coal-producing site since the 1800s. By 1895, there were numerous underground mines along the MKT railroad near Lewis, Calhoun and Windsor. Between 1942 and the early 1950s, over 1200 acres in this area were strip-mined. Large amounts of coal wastes were deposited in pits in and along the upper portions of Middle Tebo Creek near the Johnson-Henry County line. When sulfide minerals in rock are exposed to water and oxygen, they

oxidize and form highly acidic (low pH) iron- and sulfate-rich drainage, which is harmful to aquatic life. These minerals make up a large amount of the coal wastes in the Tebo Creek area. Acid mine drainage affected Middle Tebo Creek due to the large volumes of coal wastes that were continually eroding into the stream and the seepage of acid water from the surface coal waste deposits along the edges of the stream. Also, groundwater moving through the spoils is being mineralized and producing high levels of sulfate in West Tebo Creek all the way to its confluence with the main stem of Tebo Creek. About 4.5 miles of Middle Tebo Creek was rated as continuously polluted by acid mine drainage with another four miles downstream intermittently affected by slugs of acid water. Ten major fish kills in Middle Tebo occurred between 1955 and 1988.

The Missouri Department of Natural Resources reclaimed these coal waste areas in the early 1990s. A total of 486 acres were re-graded, covered with soil and revegetated. On the Middle Tebo site, a wetland was constructed for treatment of acid water and seven grade stabilization structures were placed in the creek to stabilize the stream channel. Cost for the Middle Fork of Tebo Creek and another site on East Tebo was \$4.6 million. The table of recent water quality data shows that reclamation projects have been successful in greatly reducing acid water discharge to Middle Tebo creeks. On Middle Tebo Creek there are two miles of acid water and an additional seven miles of highly mineralized water that exceeds the state standard for sulfate. The remaining acidity and sulfate problems are now due only to the movement of shallow groundwater through spoils and buried coal wastes and the emergence of these groundwaters into the Middle and West Tebo creeks. The only practical option for additional treatment would be the interception and transport of these groundwaters to a suitable treatment system. Because of the extensive nature of mined lands in this area, many individual treatment systems would be needed. A Total Maximum Daily Load (TMDL) document has been written for the Tebo Creeks impairments. The TMDL is a plan to allow streams to achieve their beneficial uses. A target for alkalinity and sulfate has been set that will protect aquatic life and wildlife and livestock watering in the Tebos. A map of the area and graphs summarizing the existing data are found below.

Map of Impaired Portion of East, Middle and West Tebo Creeks Showing Location of Sampling Sites



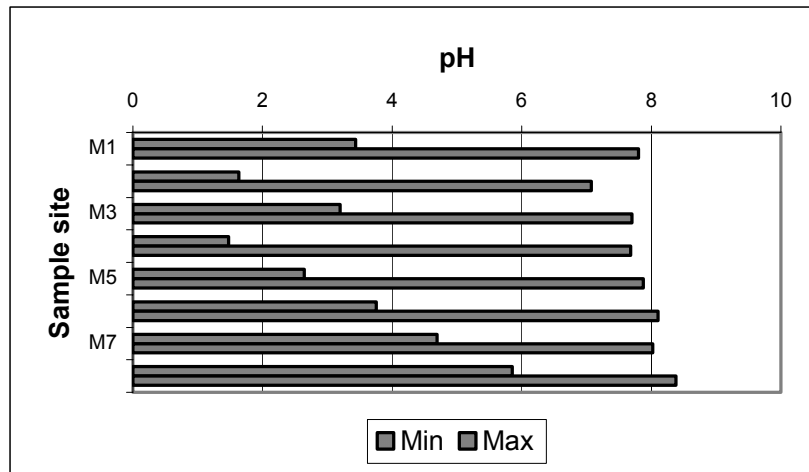
Impaired segments

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 Direction of Flow

Sample Site Index

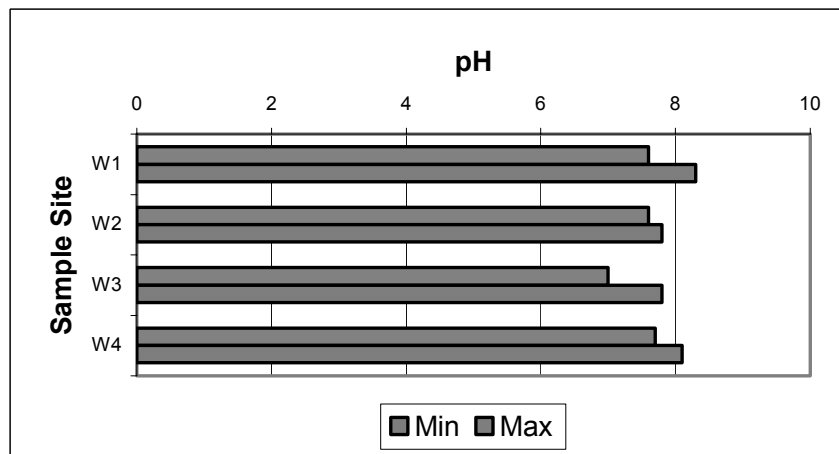
- E1 – East Fork Tebo Creek 0.5 mile above Triple AML
- E2 – East Fork Tebo Creek 0.5 mile below Triple AML
- E3 – East Fork Tebo Creek 2 miles below Triple AML
- E4 – East Fork Tebo Creek 3 miles below Triple AML
- M1 – Tributary to Middle Fork Tebo Creek 0.1 mile above AML
- M2 – Tributary to Middle Fork Tebo Creek within AML
- M3 – Tributary to Middle Fork Tebo Creek 0.1 mile below AML
- M4 – Tributary to Middle Fork Tebo Creek at Highway 2
- M5 – Tributary to Middle Fork Tebo Creek 1.2 miles below AML
- M6 – Middle Fork Tebo Creek 2 miles below AML
- M7 – Middle Fork Tebo Creek 4 miles below AML
- M8 – Middle Fork Tebo Creek at Highway 52
- W1 – Tributary to West Fork Tebo Creek
- W2 – Tributary to West Fork Tebo Creek
- W3 – West Fork Tebo Creek at Highway 52
- W4 – West Fork Tebo Creek at County Road

Range of pH values on the Middle Fork of Tebo Creek, 1987-2000



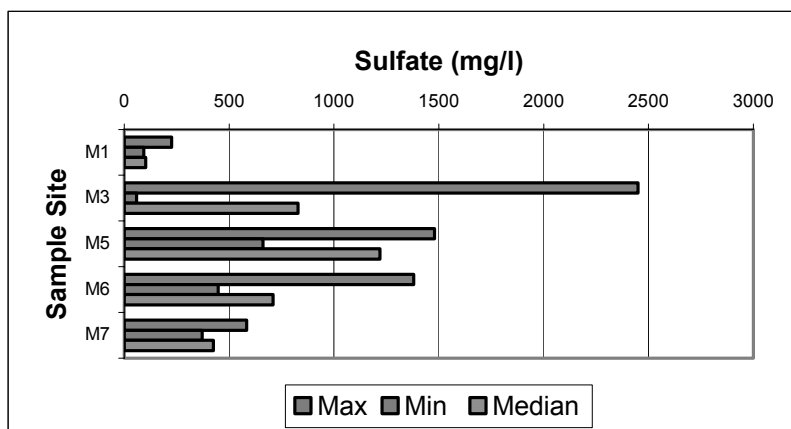
Sources: Missouri Department of Natural Resources and U.S. Geological Survey.

Range of pH values on the West Fork of Tebo Creek, 1987-2000.



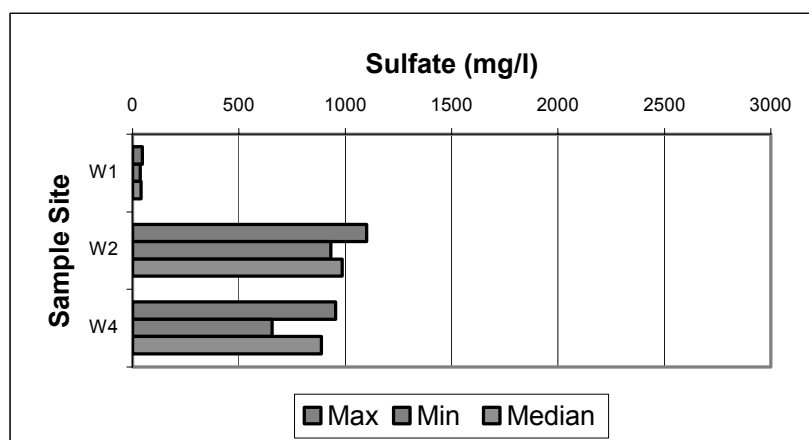
Sources: Missouri Department of Natural Resources and U.S. Geological Survey.

Sulfate concentrations in Middle Fork of Tebo Creek, 1987-2000.



Sources: Missouri Department of Natural Resources and U.S. Geological Survey.

Sulfate concentrations in West Fork of Tebo Creek, 1987-2000.



Sources: Missouri Department of Natural Resources and U.S. Geological Survey.

For more information call or write:

Missouri Department of Natural Resources

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